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AN INTEGRATED STRUCTURE OF A CRANK AND A FIVE-CLAW ASSEMBLY INTEGRALLY MOLDED FROM COMPOSITE MATERIAL FOR BICYCLE

FIELD OF THE NEW UTILITY MODEL

The present new utility model relates to an integrated structure of a crank and five-claw assembly integrally molded from composite material for bicycle, and more particularly to a crank with integrally connected five-claw assembly that is structurally smooth and has high structural strength and low structural weight, accurately controllable part dimensions, lowered manufacturing cost, and increased flexibility in forming different shapes of the crank to meet the newest trends of demands for bicycles.

BACKGROUND OF THE NEW UTILITY MODEL

A bicycle may be assembled in various manners, and generally includes a plurality of bars welded or bonded together.

On the other hand, composite materials have the properties of high strength ratio, high rigidity ratio, and good fatigue resistance, and have been employed

in manufacturing various kinds of carriers and sporting goods, particularly bicycles. Since a bicycle is manually driven, it is a common target of the manufacturers to produce a high-grade bicycle having a total weight less than 10kgs to enable faster speed and more comfortable riding. In recent years, carbon-fiber fabric has become an indispensable material to upgrade the bicycles.

Conventionally, a bicycle has cranks and five-claw assemblies made of steel, aluminum alloy, or other composite materials. However, there has not been any crank and five-claw assembly integrally molded with a composite material. Fig. 4 is an exploded perspective view of a conventional crank 50 for bicycle. As shown, the crank 50 includes a body 51 being connected at a first end to a five-claw assembly 53 that is internally mounted with a toothed-disc connector 52 and connected to the body 51 with a bolt 54. The above assembling manner is not cost-effective. The body 51 of the crank 50 must also be machined in a very complicate process to form an internally threaded pedal hole 511 at a second end opposite to the first end. When the conventional crank 50 and five-claw assembly 53 for bicycle are made of steel, aluminum alloy, or other composite materials, the following disadvantages are found in the crank and

the five-claw assembly:

1. Since the steel, aluminum alloy, and some composite materials have high unit weights, the crank and the five-claw assembly produced with such materials also have increased weight.

2. Being limited by currently available machining or forming techniques, it is unable to create new configurations for the crank with the steel, aluminum alloy, and some composite materials.

3. Conventional metal parts tend to corrode, while some composite materials are reinforced only with short fibers.

4. The crank and the five-claw assembly are separately manufactured and require subsequent cost for assembling the two parts together to therefore increase an overall cost of the bicycle.

5. The conventional metal parts have inferior appearance to reduce the commercial value thereof.

It is therefore tried by the inventor to develop a crank with integral five-claw assembly that is

structurally smooth and has high structural strength and low structural weight, accurately controllable part dimensions, lowered manufacturing cost, and increased flexibility in forming different shapes of the crank to meet the newest trends of demands for bicycles.

SUMMARY OF THE NEW UTILITY MODEL

A primary object of the present new utility model is to provide a crank having integral five-claw assembly molded from carbon fibers and epoxy resin material for using on a bicycle, so that the whole crank has reduced overall weight and enhanced structural strength.

Another object of the present new utility model is to provide an integrated structure of a crank and five-claw assembly integrally molded with a composite material for using on a bicycle, wherein the five-claw assembly is integrally provided at a first end of the crank and has a toothed-disc connector embedded in an inner wall of a central hole thereof, and the crank is provided at a second end opposite to the first end with a pedal connector, making the whole manufacturing process of the crank simpler to reduce the overall production cost of the crank.

A further object of the present new utility model is to provide an integrated structure of a crank and five-claw assembly integrally molded from epoxy material using a closed mold. The manufacturing process is simplified while the overall structure and dimensions of the finished product can be accurately controlled to enhance the overall strength of the crank. Other advantages of the crank so produced include lowered manufacturing cost, increased flexibility in forming different shapes of the crank to meet the newest trends of demands for bicycles.

BRIEF DESCRIPTION OF THE DRAWINGS

The structure and the technical means adopted by the present new utility model to achieve the above and other objects can be best understood by referring to the following detailed description of the preferred embodiments and the accompanying drawings, wherein

Fig. 1 is a cross-sectional view showing the molding of a crank of the present new utility model;

Fig. 2 is an exploded perspective view showing the crank of the present new utility model molded with and removed from the mold of Fig. 1;

Fig. 3 is a corss-sectional view of the molded

crank of the present new utility model; and

Fig. 4 is an exploded perspective view of conventional crank and five-claw assembly for bicycle.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Please refer to Fig. 1 that is a sectional view showing the molding of a crank of the present new utility model. As shown, a crank 10 having a five-claw assembly 11 provided at a first end is integrally formed with woven carbon fibers. The five-claw assembly 11 has a central hole 12 with a toothed-disk connector 13 pre-embedded in an inner wall thereof. The crank 10 is provided at a second end opposite to the toothed-disk connector 13 with a pedal connector 14. The whole crank 10 with the integrally connected five-claw assembly 11 is positioned on a lower mold half 20, which includes a recess 21 having a bar 22 upward projected from a predetermined position in the recess 21, with an auxiliary block 30 disposed between the crank 10 and the lower mold half 20. The lower mold half 20 is also provided at each of four upper corners with an upward extended engaging bar 23. After the crank 10 is positioned in place on the lower mold half 20, an upper mold half 40 is covered onto the lower mold half 20, so that a downward extended bar 41 and a plurality of

engaging holes 42 provided at a lower surface of the upper mold half 40 engage with the pedal connector 14 on the crank 10 and the engaging bars 23 on the lower mold half 20, respectively, to hold the upper and the lower mold halves 40, 20 together. At this point, apply epoxy resin to proceed with transfer molding, so that the epoxy resin permeates into the crank 10. After the epoxy resin is set, the upper mold half 40 is removed from the lower mold half 20, and the auxiliary block 30 is sideward slid away from the crank 10, as shown in Fig. 2. An integrally molded crank and five-claw assembly of the present new utility model is completed.

Please refer to Fig. 3 that is a sectional view of the completely molded crank 10 of the present new utility model. The crank 10 so molded is structurally smooth without showing any bending point on the carbon fiber material of the crank 10, and can therefore actually maintain a high strength of the material. The crank 10 made of carbon fibers also has a reduced overall weight. Comparing with a part made of aluminum-alloy and having the same design thickness, the crank 10 made of carbon fibers has an overall weight reduced by more than 40%. That is calculated with the following formula: [(2.7-1.6)/2.7]=40.74%. Moreover, since the crank 10 is integrally molded with epoxy resin in a closed mold,

the whole process for manufacturing the crank 10 and the five-claw assembly 11 is simplified while the overall structure and dimensions of the finished product can be accurately controlled to enhance the overall strength of the crank. Other advantages of the present new utility model include lowered manufacturing cost, increased flexibility in forming different shapes of the crank to meet the newest trends of demands for bicycles. Moreover, the use of the carbon-fiber fabric, which is a high-grade composite material, may create a crank having an appearance quite different from the crank made of metallic materials, and thereby increases the commercial value of the crank.

The present new utility model has been described with a preferred embodiment thereof and it is understood that many changes and modifications in the described embodiment can be carried out without departing from the scope and the spirit of the new utility model as defined by the appended claims.

What is claimed is:

1. An integrated structure of a crank and five-claw assembly integrally molded from composite material for bicycle, comprising:

a crank formed through integral molding using carbon fibers and a resin material;

a five-claw assembly formed integrally at a first end of said crank, which has a central hole having a toothed-disc connector embedded in an inner wall thereof, and

a pedal connector disposed at a second end opposite to said toothed-disc connector and said carbon fiber and resin materials enabling said crank to be structurally smooth and have reduced overall structural weight and enhanced structural strength.

2. The crank and five-claw assembly integrally molded with composite material for bicycle as claimed in claim 1, wherein said resin material comprises an epoxy resin.

ABSTRACT OF THE DISCLOSURE

An integrated structure of a crank and five-claw assembly integrally molded from composite material for bicycle includes a crank being integrally formed at a first end with a five-claw assembly, which has a central hole having a toothed-disc connector embedded in an inner wall thereof, and at a second end opposite to the toothed-disc connector with a pedal connector. The crank with integral five-claw assembly is made of carbon fibers and epoxy resin, and is therefore structurally smooth and has reduced overall structural weight and enhanced structural strength.

408752 14×4=56

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(各欄由本局填註)

公 告 本

新型專利說明書

一、名稱	中文	複合材料一體成型自行車曲柄與五爪組合結構
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中文創作摘要 (創作之名稱：複合材料一體成型自行車曲柄與五爪組合結構)

一種「複合材料一體成型自行車曲柄與五爪組合結構」，該曲柄係與五爪以碳纖維與環氧樹脂兩種材料作複合一體成型，而五爪之內緣孔中設置有一齒盤接頭，其之對稱端裝設有一踏板接頭，俾令整體結構性順暢，可降低整體結構之重量，有效增強整體之結構性者。

英文創作摘要 (創作之名稱：)

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創作說明（1）

創作概述》

本創作係關於一種「複合材料一體成型自行車曲柄與五爪組合結構」，尤指一種結構性順暢，確切保有高強度材料特性，可降低整體結構之重量，有效增強整體之結構性，並可精確控制零件整體結構及尺寸，強化整體強度，確切降低生產成本，且成形自由度大，可製造流線形新潮流之產品外型，誠具實用性者。

《創作背景》

自行車之組裝結構林林總總，何其繁多，大部分係由數支桿體以交錯焊接方式或膠合接著方式作組裝接合，構組件變化之多亦讓「自行車王國」的美名享譽至今，未曾稍減。

按，複合材料具有高比強度、高比剛性及良好的耐疲特性，已運用在各式載具及運動器材上，尤其是自行車人為動力來源，為了追求更快的速度及舒適感，更將全總重小於10公斤作為高級車之標準，近年來為了提昇產形象更將碳纖維布料作為必備的材料。

傳統自行車曲柄及五爪的材料為鋼材、鋁合金或複合料，但目前仍無複合材料一體成型的曲柄及五爪組合結；如第四圖所示，係為習用曲柄之立體分解圖，該曲柄0係以柄體51之一端裝設一具齒盤接頭52之五爪5，並以一螺栓54栓設之，如此之製作組裝方式，實不經濟成本效益，且其亦需於柄體51之另端車製一腳踏

創作說明 (2)

螺孔５１１，加工過程甚為繁複；且傳統習用自行車曲柄及五爪的材料為鋼材、鋁合金或複合材料更有如下之限制與缺點：

（一）因其單位重量重，故所製作出之成品重量相對增加不少。

（二）加工成形技術受限，造型無法突破趕上潮流。

（三）金屬零件會產生銹蝕現象，而複合材料僅為短纖補強。

（四）曲柄及五爪分開製造，浪費後續組合工時及成本相對提高。

（五）產品形象無法提昇，價格利潤不高。

諸上述之種種問題，乃一般習知自行車曲柄及五爪組裝之窠臼，故有其改良之必要。

有鑑於此，本創作者即憑恃著個人長期對於自行車曲柄及五爪結構之研究及融會貫通之構思，而創作出一種結構性順暢，確切保有高強度之材料特性，可降低整體結構之重量，有效增強整體之結構性，並可精確控制零件整體結構及尺寸，強化整體強度，確切降低生產成本，且成形自由度大，可製造流線形或新潮流之產品外型之「複合材料一體成型自行車曲柄與五爪組合結構」，使其使用上更為具實用性。

《創作目的》

緣此，本創作之主要目的係在提供一種複合材料一體

創作說明 (3)

型自行車曲柄與五爪組合結構，該曲柄係與五爪以碳纖與環氧樹脂兩種材料作複合一體成型，整體結構性順勢，可降低整體結構之重量，有效增強整體之結構性者。

本創作之次要目的係在提供一種複合材料一體成型自行車曲柄與五爪組合結構，由於五爪之內緣孔中預埋有一軸盤接頭及其之相對稱端裝設有一踏板接頭，故可減少整體之製作流程，相對減少加工成本者。

本創作之又一目的係在提供一種複合材料一體成型自行車曲柄與五爪組合結構，因曲柄乃係採用密閉模具以環氧樹脂一體成形技術，可確切簡化自行車曲柄與五爪組合結構的生產程序，並可精確控制零件整體結構及尺寸，強化整體強度，確切降低生產成本，且成形自由度大，可製造流線形或新潮流之產品外型，對自行車產業乃係一大突破者。

《詳細說明》

為使審查委員對本創作能進一步的瞭解，以下茲舉一較佳實施例，並配合圖示、圖號，將本創作之構成內容及其所達成的功效詳細說明如后：

《圖面之簡單說明》

第一圖係為本創作曲柄成型時之剖面示意圖。

第二圖係為本創作曲柄成型後之立體分解示意圖。

第三圖係為本創作曲柄成型後之剖視圖。

創作說明 (4)

四圖係為習用曲柄之立體分解圖。

《圖號說明》

10・・・曲柄	
11・・・五爪	12・・・內緣孔
13・・・齒盤接頭	14・・・踏板接頭
20・・・下模	
21・・・容置槽	22・・・凸柱
23・・・嵌柱	
30・・・輔助塊	
40・・・上模	
41・・・凸柱	42・・・嵌孔
50・・・曲柄	
51・・・柄體	511・・・螺孔
52・・・齒盤接頭	53・・・五爪
54・・・螺栓	

《具體實施例說明》

請參閱第一圖所示，係為本創作曲柄成型時之剖面示意圖，複合材料一體成型自行車曲柄與五爪組合結構其係預先將以碳纖維編織好之曲柄10裝置於裝設有一輔助塊30之下模20之容置槽21上，而該曲柄10之一端具有與曲柄10一體編織之五爪11，五爪11內緣孔12中預埋有一齒盤接頭13，齒盤接頭13之相對稱端裝設

創作說明 (5)

一踏板接頭１４，而該下模２０之容置槽２１適當處凸出一凸柱２２，且四角落處另凸設出各一嵌柱２３，待柄１０裝設定位後，復將具凸柱４１及嵌孔４２之上模０與下模２０作嵌合固定，此時，以環氧樹脂作轉注成，使環氧樹脂滲入曲柄１０中，待其硬化後，開啟上模０，並將曲柄１０上之輔助塊３０作側向滑移取出（如二圖所示），即為本創作一體成型自行車曲柄與五爪組結構。

請參閱第三圖所示，係為本創作之曲柄成型後之剖視，本創作所成型之曲柄１０結構性順暢，且碳纖維材質毫無轉折點出現，確切保有高強度之材料特性，且因曲柄１０係以碳纖維為材質，可降低整體結構之重量，若以厚度作為設計參考，則碳纖維零件將比鋁合金零件減重４０％以上〔（2.7-1.6）/2.7=40.74％〕；再者，因曲柄１０乃係採用密閉模具以環氧樹脂一體成形技術，可確切簡化自行車曲柄與五爪組合結構的生產程序，並可精確控制零件整體結構及尺寸，強化整體強度，確切降低生產成本，且成形自由度大，可製造流線形或新潮流之產品外型，對自行車產業乃係一大突破；又，以高級複合材料碳纖布紋作為產品外觀，有異於傳統金屬形狀，可進一步提升產品的造型及價值，深具實用性者。

綜上所述，本創作複合材料一體成型自行車曲柄與五爪組合結構，係提供一種結構性順暢，確切保有高強度之材料特性，可降低整體結構之重量，有效增強整體之結構

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創作說明 (6)

，並可精確控制零件整體結構及尺寸，強化整體強度，一切降低生產成本，且成形自由度大，可製造流線形或新流之產品外型，誠具實用性者，且其構成結構又未曾見諸書刊或公開使用，誠符合新型專利申請要件，懇請局明鑑，早日准予專利，至為感禱。

需陳明者，以上所述乃是本創作之具體實施例及所運之技術原理，若依本創作之構想所作之改變，其所產生之功能作用仍未超出說明書及圖式所涵蓋之精神時，均應在本創作之範圍內，合予陳明。

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申請專利範圍

1、一種複合材料一體成型自行車曲柄與五爪組合結構，其構成包括：

一為碳纖維與樹脂複合一體成型之曲柄，該曲柄之一側具有五爪，五爪之內緣孔中設置有一齒盤接頭，其之相對稱端裝設有一踏板接頭，俾令整體結構性順暢，可降低整體結構之重量，有效增強整體之結構性者。

2、依據申請專利範圍第1項所述之複合材料一體成型自行車曲柄與五爪組合結構，其中上述之樹脂係可為環氧樹脂者。

申請案件名稱:複合材料一體成型自行車曲柄與五爪組合結構

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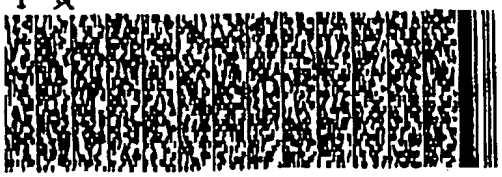
1 頁



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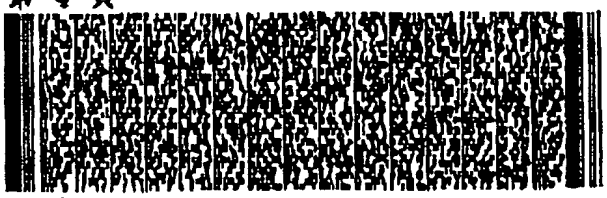

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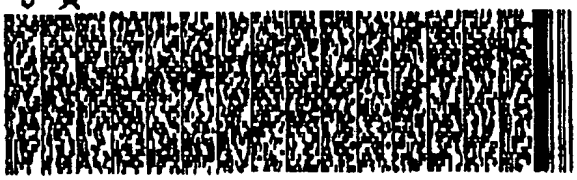

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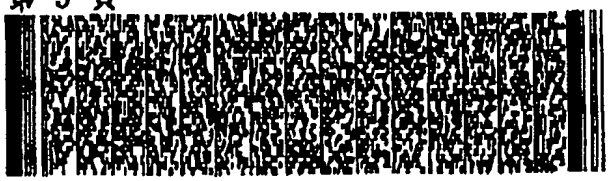

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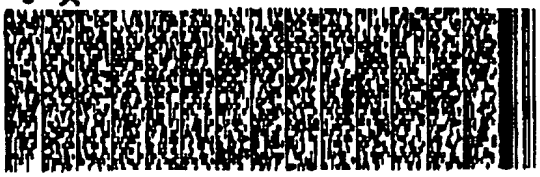

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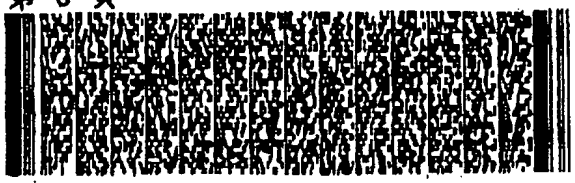

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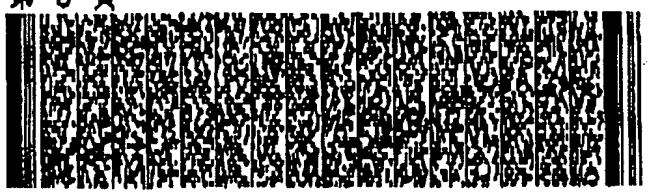
第 8 頁



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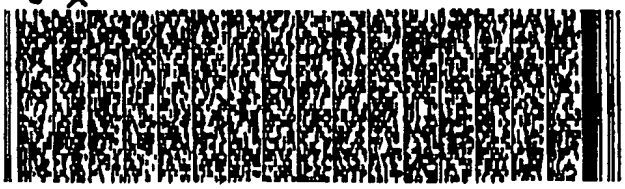

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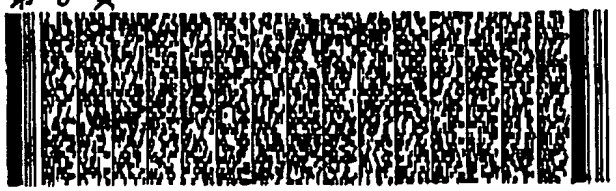

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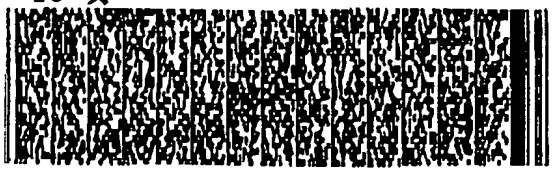

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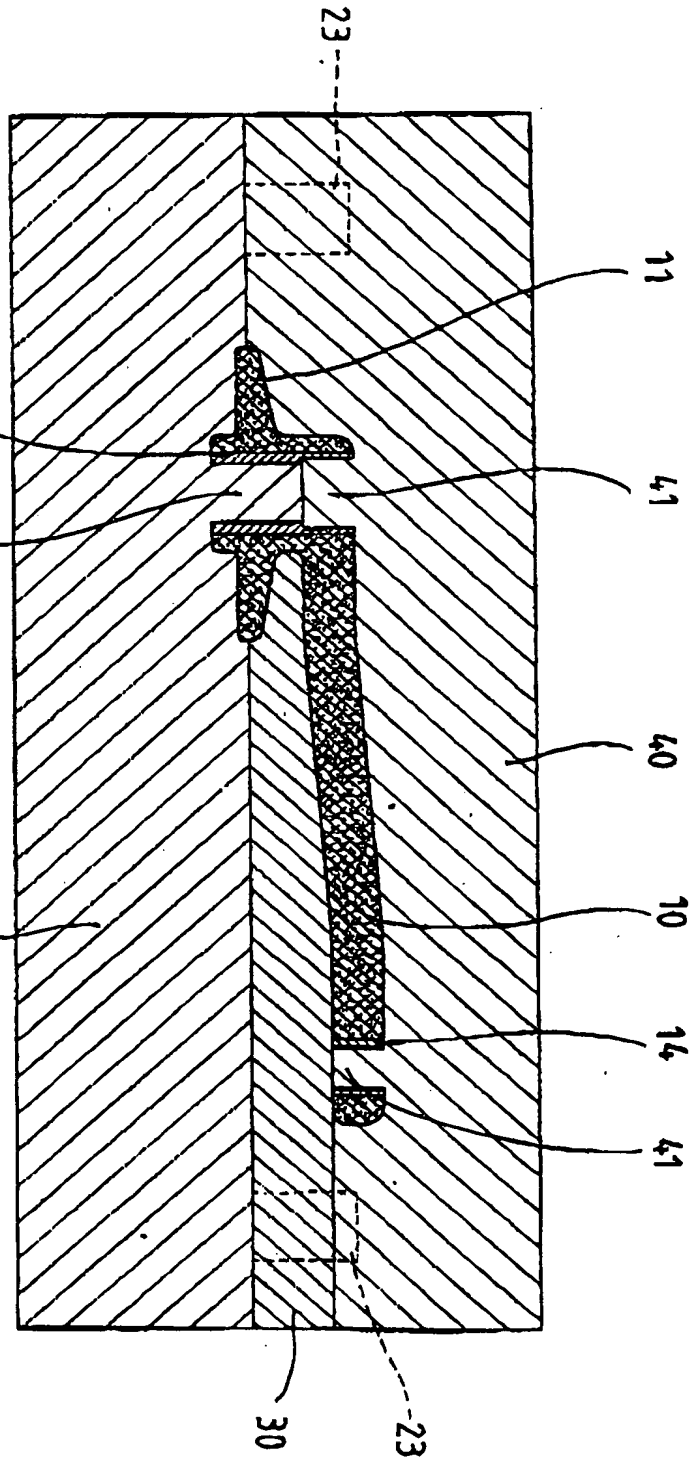

第一圖

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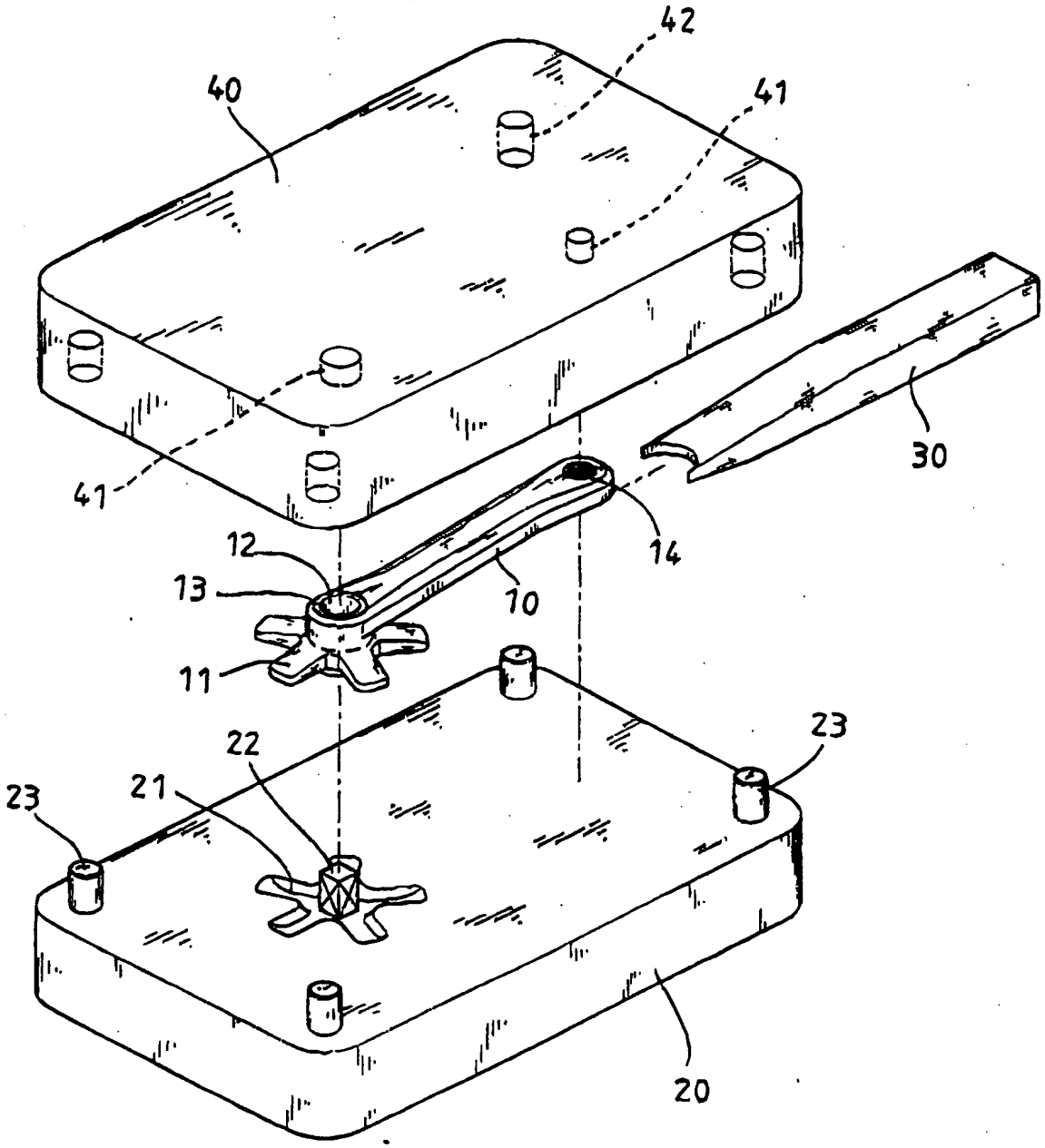

第 二 圖

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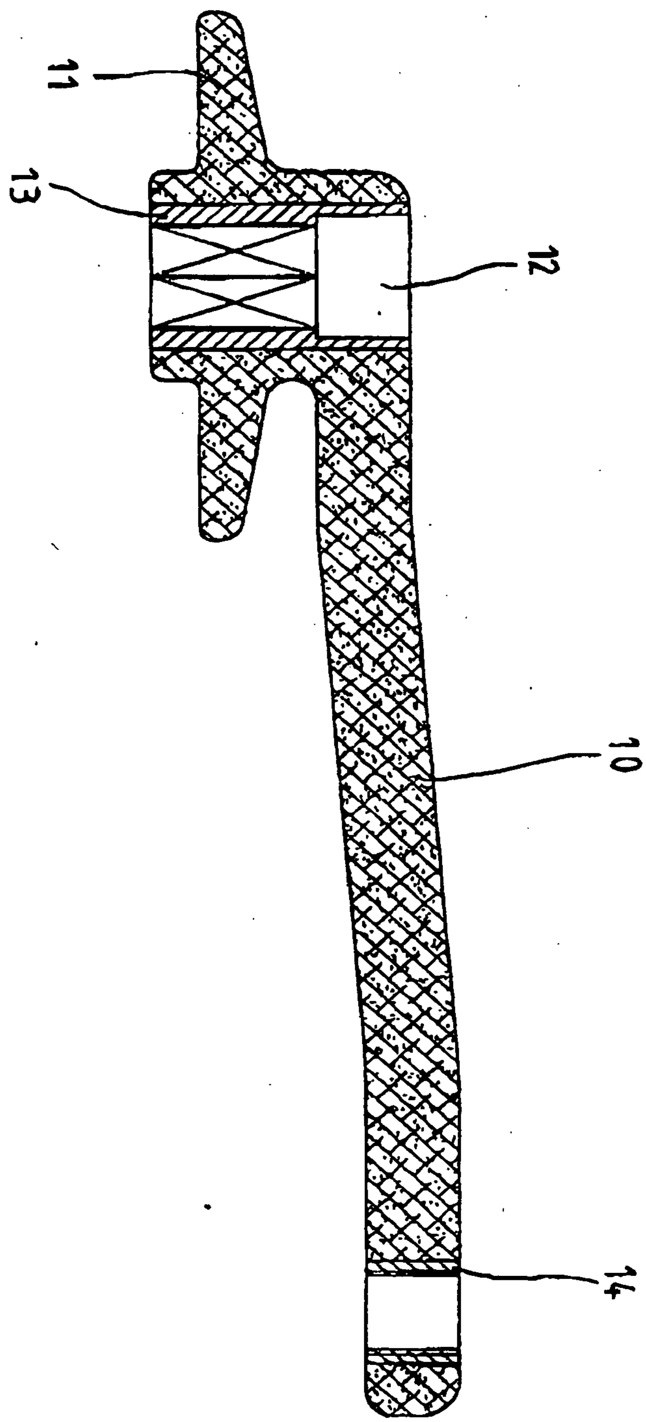

第三圖

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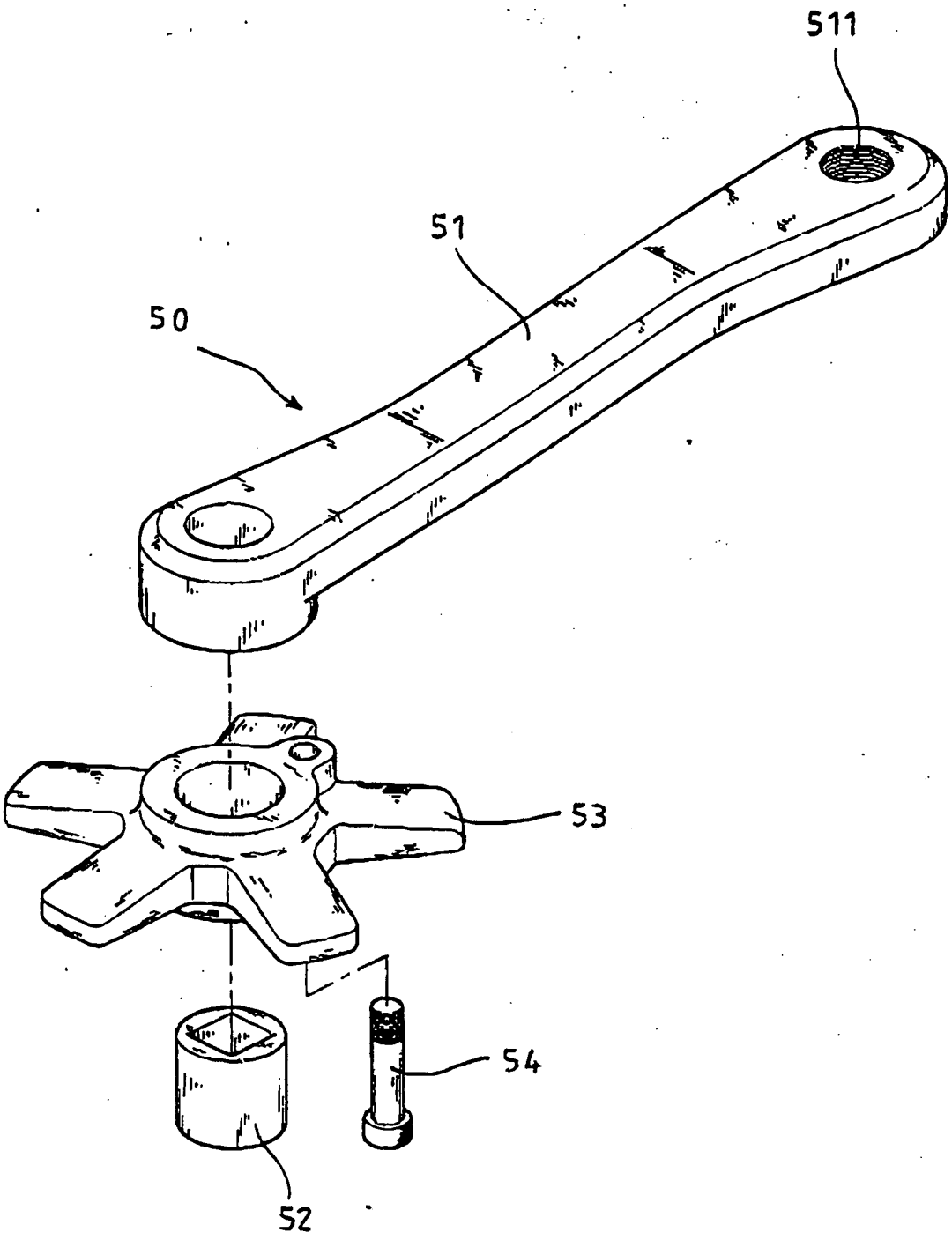

第四圖